and electricity mains, and reviews briefly the law governing mining subsidence in Great Britain. He presents a critical summary of the more important theories of subsidence which have been brought forward and discusses the methods used for mitigating the damage to property. Two chapters are devoted to the observations made in Great Britain, America, and India on the occurrence of subsidence. Prof. Briggs also deals with the bending of the strata and the fracture due to shear, and gives his conclusions regarding the mechanism of mining subsidence.

Though addressed particularly to members of the coal-mining profession, the book refers to a subject which in some parts of Great Britain is of great importance to lawyers, architects, engineers, public utility companies, and local authorities.

Operational Circuit Analysis. By Prof. Vannevar Bush. With an Appendix by Prof. Norbert Wiener. Pp. x + 392. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1929.) 22*s.* 6*d.* net.

THE literature on the subject of operational circuit analysis is now quite extensive. Authors are simplifying and developing the methods introduced by Oliver Heaviside in his "Electrical Papers" and in his "Electromagnetic Theory". Yet beyond a recent paper published by Dr. Sumpner in the June number of the *Proceedings of the Physical Society*, there are few books or papers which explain these methods in a way that can be understood by physicists and engineers. Some use these methods without understanding in the least the mathematics of the differential equations on which they are based; they are, in fact, simply computers.

Heaviside usually evaluated his operators by expanding them in series and applying them term by term to the original function. This process has the advantage that only elementary mathematics is needed. In many cases, however, when the legitimacy of the steps is examined carefully, pitfalls are found which it is necessary to avoid. In dealing with series developments of operators, it is only too easy to get off the track. Sometimes we have to use series which converge up to a certain term and then they begin to diverge. It is absolutely necessary to know where to stop.

Prof. Bush emphasises the fact that he writes as an engineer and not as a mathematician. To engineers, this book will be found helpful. The mathematicians now treat Heaviside's operator on the lines of a complex variable and submit it to contour integration (see a paper by the late Dr. Bromwich in the *Proc. Lond. Math. Soc.*, **15**, 401-408; 1916). He shows that if the operators are interpreted in the form of complex integrals, the slippery places reveal themselves at once.

Electricity Applied to Mining. By H. Cotton. Pp. xi + 625. (London: Sir Isaac Pitman and Sons, Ltd., 1929.) 35*s.* net.

RECENT events in the mining industry point conclusively to the fact that its continued existence necessitates that old methods and old machinery should be ruthlessly scrapped, and that electric power should be used to a far greater extent than in the past. We are glad, therefore, that in this volume the more recent methods and modern specialised plant are adequately discussed. In the earlier chapters the usual academic discussion of generation and distribution is given. Later on, when describing the electrical gear requisite for any particular drive, full particulars are given of the peculiar characteristics of the drive. For example, the operating engineer must know whether it is a fan, a compressor, or a pump. Speed regulation is of great importance with certain drives, and the author rightly lays stress on this.

The increased capacity of the machinery now available for handling the coal taken from the coal-face makes the replacement of hand labour by machine coal cutting inevitable. The actual process of coal winning is of greater importance than pumping, ventilating, or hauling. It is not economical to retain hand labour in a pit where the use of coal cutters is permissible. It has been calculated that about three times the output can be obtained from a given working face by using machines instead of hand labour. The motive power used for the coal cutter is either electricity or compressed air. In certain districts, especially in South Wales, the seams are so 'gassy' that compressed air must be used. On the other hand, in Scotland, where the mines are not gassy, the motive power for the coal cutters is nearly always electricity. We hope that many collieries will be able to obtain power from the national high tension mains.

Engineering Economics. By T. H. Burnham. Pp. xiii + 326. (London: Sir Isaac Pitman and Sons, Ltd., 1929.) 10*s.* 6*d.* net.

AT the time of the inclusion of the subject of engineering economics in the syllabus for the examination for the associate membership of the Institution of Mechanical Engineers, there was no general text-book to which students could go for guidance in their studies. Attempts have been made to supply this need, and among the most successful must be placed this book by Mr. Burnham. Engineers who rise to the head of their profession are often more engaged in questions of administration than in questions of design and production, and some of the matters on which they have to be informed are indicated by the chapters in this book, namely, finance, foreign exchange, joint-stock companies, insurance, organisation, industrial legislation, and research.

The industrialist often asks: Does research pay? This, to our mind, is a curious question when one remembers that the steam engine is the direct outcome of the discovery of Torricelli of the pressure of the atmosphere, that our knowledge of electricity really begins with Gilbert's work, and our knowledge of the laws of motion with that of Galileo. Pasteur was one of the world's greatest investigators, and it was Huxley, who said, "Pasteur's discoveries have brought France more